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# EPIDEMICS OF THE CENTURY,

AND THE

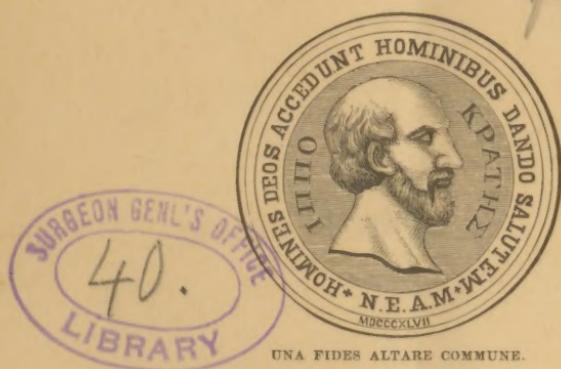
## LESSONS DERIVED FROM THEM.

BY

GOUVERNEUR M. SMITH, M. D.,

VICE-PRESIDENT OF THE NEW YORK ACADEMY OF MEDICINE; PHYSICIAN TO THE NEW YORK AND TO THE PRESBYTERIAN HOSPITALS, ETC.

[REPRINTED FROM THE TRANSACTIONS OF THE NEW YORK ACADEMY OF MEDICINE.]



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Author



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1876.



From the author.

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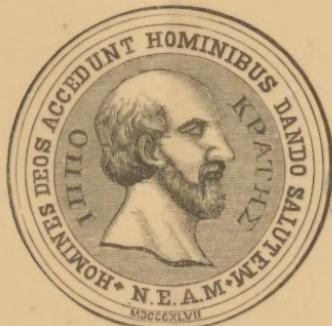
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## EPIDEMICS OF THE CENTURY, AND THE LESSONS DERIVED FROM THEM.

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Read May 4, 1876.

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CIVILIZATION of modern times makes rapid progress, and a consideration of its yearly advancement and of the diseases incident thereto is a prolific subject of study.

In the review which is being taken by this Academy of the progress of medical science during the century of our national existence, the department of epidemics has been assigned to me for presentation on this occasion. The limits of a single discourse will admit only of a mere glance at this important topic, but the glance will be sufficient to show the industry and the success of our profession in elucidating the causes and in improving the management of those pestilential disorders which have appeared within our territory.

The period of review begins with the year 1776 and ends with the present year, 1876—a century peculiarly interesting to the American people, and pregnant with events which have moulded and which are still to mould the destinies of the world.

If we look across the ocean at the beginning of this period we find the indefatigable John Howard, of England, in the prime of life exploring the adyta of penal institutions and endeavoring to improve the morals and health of their inmates. At a later time, viz., in 1790, we find him fifteen hundred miles from home and, while pursuing his philanthropic duties,

dying in Russian Tartary. Princes, admirals, generals, magistrates and peasants united in paying him funeral honors—the land of the czars unheeding the fact that plebeian blood had nourished his royal heart. In the cathedral and valhalla of St. Paul in his native land can be read this description: He expired “a victim to the perilous and benevolent attempt to ascertain the cause of and find an efficient remedy for the plague. He trod an open but unfrequented path to immortality in the ardent but uninterrupted exercise of Christian charity.”

His biographer informs us that “His death fell on the mind of Europe like an ominous shadow: the melancholy wail of grief which arose on the Dnieper was echoed from the Thames and soon reechoed from the Tagus and the Neva and the Dardanelles.” No allusion is made to the effect which was produced on the shores of the mighty Hudson of the young American republic—the hum of a busy civilization was scarcely then audible on its thinly populated banks and the republic had scarcely assumed a recognized position in the brotherhood of nations. But our forefathers, imbued with advanced ideas of political and religious liberty, and differing in opinion from the nations of the Old World on these topics, were nevertheless ready to adopt the tenets of transatlantic philanthropy if originating either in the ages of a near or a remote antiquity or among contemporaneous peoples with whose political teachings they were at variance.

Nothing can better illustrate the American medical spirit of the period to which allusion is made than a glance at the brief but brilliant life of Dr. Elihu H. Smith. History demands a recognition of his useful career: I know not if a relative survives him.

Born in Litchfield, Conn., in 1771, he ripened into manhood at a time when Howard was prosecuting his benevolent work in Europe, and was but nineteen years of age at the time of Howard’s decease. Settling as a young physician in New York, he was appointed physician to the New York Hospital, and became associated in 1798 with Dr. Samuel L.

Mitchell and Dr. Edward Miller in editing *The Medical Repository*, which was the first American medical periodical published in this country. The *first* paper in the *first* number of this journal was from the pen of Dr. Smith, and was entitled "The Plague of Athens." This classical essay can be read with profit at the present day.

The statesmen of that period were using their best exertions to strengthen the resources of the republic; the physicians with no less patriotism were endeavoring to shield the country from those pestilential besoms which in the Old World had so often inspired terror and induced desolation.

Dr. S., in concluding his paper, said: "If local causes originated a pestilence in Athens, local causes may generate a yellow fever in Philadelphia and New York. To these, then, be our attention more scrupulously directed, and let us be more solicitous in the inspection of our houses, yards, streets, and docks, than in that of cottons and woolens of vessels from the West Indies and ships from the Mediterranean."

Unfortunately for science, in the very year in which this paper was published, viz., 1798, Dr. S., while in his twenty-seventh year was smitten, in September, with yellow fever, then disastrously prevailing in this city, and closed his career.

*The Medical Repository*, in announcing his decease, says: "As a physician his loss is irreparable. He had explored at his early age an extent of medical learning for which the longest lives are seldom found sufficient; . . . he was ripe for the highest honors of his profession, his merits were every day becoming more conspicuous, and nothing but his premature fall deprived him of that extraordinary degree of public confidence which awaited a longer continuance of his life."

In the second volume of the periodical before mentioned is found a posthumous paper of Dr. S. "On the Pestilential Diseases which at Different Times appeared in the Athenian, Carthaginian, and Roman Armies in the Neighborhood of Syracuse."

Allusion has thus early been made to the labors of Dr.

S., whose career commenced with the century ; and the efforts of others might have been cited with like propriety, in order to remind us that while the fires of genius are now burning brightly on our altars, they were not kindled by those who are within our personal recollection, but were ignited by those whose lives were identified with the early period of our national existence. The fact is also illustrated that then, as well as now, youthful enthusiasm helped to develop and to mould medical philosophy.

It would be unbecoming on an occasion like the present to give the details of the various epidemics which have visited our territory ; it must suffice to group their general features and to evoke therefrom general deductions. Monuments to each pestilential visitation are thickly found in medical literature, and the explorer of to-day has merely to read their inscription to learn of their desolations, and to find not unfrequently the interment of various theories regarding the etiology and management of occult morbific influences.

In investigating our subject it will be found that several disorders which formerly were chiefly feared on account of their periodical general appearance have bequeathed to us venoms which have become naturalized in our midst, and which, though constantly and to a certain extent disastrously operative, are nevertheless prevented from exercising a very general pernicious influence by reason of the enforced sanitary regulations respecting them.

Our immediate territory is so far remote from the tropics that it can scarcely harbor and foster, for a long season at least, miasmata which are peculiar to the equatorial region of the earth. Nevertheless, we have a climatic season in which, by reason of the high temperature, if southern poisons are introduced, they may assume in our midst a pestilential character. Indeed, the ordinary maladies of our summer correspond in their nature with those which are observed in torrid situations, but are fortunately of less gravity.

Nations of the earth, in order to be regarded as mighty powers, must acquire a typical strength—such strength being

shown in the ability they possess for self-preservation. They must possess a force sufficiently vigorous to control their internal political and disturbing influences, and likewise a force capable of arresting the inroads of invading neighbors.

The inhabitants of the northern temperate zone—a zone recognized as the one in which man attains his highest mental and physical development, and the one in which our lot is cast—the inhabitants, I say, of this zone, being favored by natural causes, and by the advances of civilization, should feel it obligatory upon them to protect themselves not only from internal causes of disease, but also from the encroachments of inimical morbific influences from other zones, nations, and localities. Here intelligence and wealth, the resources of science, and the benevolent operations of religion, can best unite to develop manhood.

It can be clearly demonstrated that we of the present day, by reason of the advancement and diffusion of scientific knowledge, are better fitted than were our forefathers of a century ago to cope with various noxious agencies. Communities are not so readily panic-stricken as formerly at any threatened approach of pestilential diseases, being less superstitious and having more faith than formerly in artificial counteracting influences.

New sources of disease are developed by civilization—new measures of prophylaxis germinate simultaneously with each genesis. Many of the poisons with which we are familiar, and which were known to our ancestors, are not as yet to be extinguished, but are to continue to harass posterity. Posterity will encounter ills which have not afflicted us, and the medical literature of future centuries will relate the outcrops of novel disorders, and record the successful means by which they were held in abeyance. If the chemists are capable of producing new compounds, it can be inferred by analogy, and even inferred from a study of past ages, that in the mutations of society new forms of aërial contaminations and new zymotic affections will be developed by reason of the overcrowdings of population, by the influences of new occupations and of new

relations of life. The opening of new territories to civilization will be attended with its dangers. Indigenous germs of disease may exist in unexplored Africa and in other secluded parts of the globe, which are in time to be conveyed to marts of commerce, and thence to be still more widely diffused.

These prefatory and textual remarks lead us to a consideration of the epidemics which have chiefly excited interest.

The disorders which have thus appeared have been variously grouped. In the nosologies which have been accepted during the century, commencing with the one of Vogel in 1772, and subsequently in those of Sagar, Macbride, Cullen, Darwin, Crichton, Pinel, Parr, Young, Good, Hosack, and in the one adopted by our present Board of Health, as recommended by the International Statistical Congress, we find that the diseases under consideration have been classified in diverse manners, such variations being made to adapt the grouping to modified medical views respecting the etiology of the maladies.

The late Dr. Joseph M. Smith, in his "Report on the Medical Topography and Epidemics of the State of New York," submitted to the American Medical Association at its annual meeting in June, 1860, in writing on this subject, remarked: "Distributed according to their natural affinities or etiological relations, epidemics are reducible to three kinds, viz., *contagious*, *infectious*, and *meteoratious*. These terms are here employed in the sense they are used in the writer's work on the 'Elements of the Etiology and Philosophy of Epidemics.'"<sup>1</sup>

In such grouping, under the contagious epidemics were placed, small-pox, measles, scarlatina, and, as minor affections, varioloid and varicella; under the infectious, intermittent and remittent fevers, dysentery, yellow-fever, typhus, and compound fevers; under the meteoratious, influenza, typhoid pneumonia, diphtheria, erysipelas, and Asiatic cholera.

This classification, at the time, appeared as concise and as

<sup>1</sup> "Transactions of the American Medical Association," vol. xiii., 1860, p. 175.

accurate as it could possibly be made with the current scientific data. During the last decennary, the powers of the microscope as an instrument of etiological investigation have greatly increased, the spectroscope has developed new methods of inquiry, and experts have been in conference collecting observations and collating facts.

To say nothing at present of the careful study given to other epidemic disorders, what special attention has been given to cholera! An International Sanitary Conference, convened at the instance of the Austro-Hungarian Government, held at Vienna in 1874, devoted an entire month to a study of this malady. At the conference, Persia, Egypt, and every European state, were represented—an assemblage of delegates representing twenty-two nationalities. It is not a matter of surprise that, as a result of such advanced studies of epidemics, views concerning some of them have been modified.

Medical philosophy is now grasping after material or appreciable causes to explain morbid phenomena—theories, though admissible to investigation, must be sustained by observations which can, in part at least, be practically demonstrated by the chemists and microscopists.

I shall subsequently refer to the labor which has been expended upon the study of minute vegetable organisms and entozoa as causes of diseases. At present it must suffice to allude to the former of these.

There are so-called *filth-diseases*, as appropriately denominated by Mr. John Simon. Excrementitious material from animal organisms, the refuse of households, factories, etc., either in rural or in city localities, may become causes of disease if not properly disposed of. Such excrement can largely be utilized to promote the welfare of the state in its agricultural interests, but, instead of its being thus employed or being rendered innocuous, it is constantly operative as a cause of disease and death.

These *débris* may become poisonous in a twofold manner:  
1. They are liable to decomposition, and the inorganic gases thus developed, unless under circumstances permitting their

free diffusion, are injurious to those respiration them. Their effect, however, upon the animal economy is comparatively slight, and, the gases being merely inorganic, chemical compounds have no power of self-multiplication to induce further mischief beyond the persons of those who have inhaled them.

2. The *débris* alluded to are a fertile soil for the growth of noxious minute vegetable organisms. The refuse, if wisely distributed over glebes, rewards the laborer with turf teeming with cereals and rich in its production of edible vegetation; but, unwise hoarded, this same material fosters the most luxuriant growth of innumerable microscopic vegetative growths, which bodies, being organic in their nature, possess the power of reproduction to an indefinite extent, even in other localities than those in which their development is specially favored. Some of these growths are believed to possess properties as conspicuously poisonous to mankind when gaining access to the system through the air, food, or water, as are the well-recognized benign influences upon the economy of the fruits of meadows and table-lands.

In the study of plants of the lower grade, Klein is asserted to have discovered the microphyte of enteric fever. In cholera, scarlet fever, diphtheria, vegetable growths have been observed, and, in various diseases, the excreta from the bowels, etc., are supposed to contain the germs of the prevalent morbid infections.

Vegetation, indeed, induces disease in vegetation. The Scripture says, "I smote you with blasting and mildew." "Blasting" and "mildew" have scourged the crops of the ancient Jews and Romans. The modern farmer employs the terms *smut*, *bunt*, *rust*, and *mildew*, to describe the more common diseases of vegetation, and, on a former occasion, as I have said before this Academy, these conditions are induced by vegetable parasites. Not a plant cultivated by man is free from such fungi. In the recent investigation of disease, as affecting the inferior animals and man, similar growths are believed to play an important part in their production.

But, while admitting such to be the case, there are doubt-

less other coöperative factors favoring the spread of epidemic disorders. There are atmospheric states which exert potent influences in promoting the diffusion of maladies. Those which are readily recognized, such as relate to heat, cold, moisture, dryness, electricity, calm, winds, etc., are observed to affect intensities of prevalence. As respects electricity, we appreciate the deadly result of the shaft of lightning—are there not obscure influences of this principle at times operative, concerning which we are unaware? The atmosphere is never in a state of stable electrical equilibrium, and it is unphilosophical to suppose that varying electrical conditions exert no influence, directly or indirectly, upon animate nature.

Respecting ozone, that mysterious, active, and condensed form of oxygen, how comparatively little is known as regards its general effects! Its presence in the air varies with the time of day and with the prevalence of certain winds, and is less appreciable in over-crowded localities than in uninhabited or sparsely-settled regions. We recognize it as the great oxidizing and purifying agent—an agent which is readily metamorphosed, for while speeding in its noble mission of reformation, and while in the act of purification, it is transmuted into the simpler form of oxygen.

Ozone, when undiluted, is irrespirable, and when but moderately diluted, oxidizes the blood unnaturally and induces pulmonary irritation and systemic disturbance. It is readily inferred that, when this principle is present in a comparatively small quantity in the atmosphere, those respiring it are not thereby sufficiently vitalized, and that local mephitic agencies, bereft of a counteracting influence, acquire augmented morbid powers. When this same principle occurs excessively in the air, there is every reason to believe that other morbid phenomena are induced. More precise knowledge concerning this principle is needed, as well as of other principles of whose presence in the atmosphere we are already aware.

Is there not an "epidemic meteoration," or condition

which comprehen-sis "insensible qualities of the general atmosphere, which produce or favor the prevalence of popular diseases?"<sup>1</sup> Investigations in this direction have not, as yet, been fully made. We have not, as yet, been furnished with instruments or means of inquiry sufficiently accurate to decipher occult influences of the atmosphere, and such an inquiry is essential, if we are to fully understand the wide-spread appearances of disease.

Water impregnated with certain organic and inorganic material is inimical to health; the atmosphere similarly contaminated is similarly noxious. The air is more complex in its chemical nature than water, and is, consequently, liable to greater vicissitudes in composition, and its principles, not all being chemically combined together, may be capable of behaving, under peculiar circumstances, in a mysterious way upon mankind. There is not that same stable constitution in air as there is in water *per se*.

While diffusion in the atmosphere prevents a universal and dangerous contamination from local pernicious causes, nevertheless, combined aërial and terrene conditions may render considerable regions of territory insalutary. A disease may be contagious through excreted germs, but for the disease to spread over extended areas the germ and atmosphere must be coadjutors; in other words, the germ must find a congenial medium in which either to sustain its life or to promote its growth, multiplication, and diffusion. It is, doubtless, true that the air at times is a mere vehicle of morbid germs, and such germs, when meeting congenial terrene or systemic conditions, there fructify, as the seeds of grass, etc., may be wafted by winds to develop in distant and fruitful soils.

Points of investigation specially needing elucidation at present are these: To what extent are meteorological conditions alone responsible in the production of disease? To what extent are morbid germs culpable? What aërial conditions essentially favor germ diffusion? To what degree are inor-

<sup>1</sup> See "Elements of the Etiology and Philosophy of Epidemics," by Joseph Mather Smith, M. D., New York, 1824, p. 115.

ganic mephitic influences operative in the causation of disease?

Another point of interest relating to etiology is an inquiry into the nature of the development of a contagious element in the course of certain inflammatory diseases, and into the processes by which a multiplication of infectious germs takes place within the animal economy, irrespective of vegetative growth.

Puerperal fever occasionally seems to occur, even when the patient is under the most auspicious circumstances, and when there has been no appreciable inoculation with the disease, and from such a case contagion may arise and be diffused. It is common to attribute such a febrile genesis to a poison generated within the uterus, from decaying clots, portions of placenta, etc., which is absorbed into the system.

It has not been easy to explain the multiplication of the poison—the spread of the disorder. May it not be accounted for in this way? If innumerable *bioplasts* are eliminated from such a patient, is it not presumable that these minute organic particles are impregnated with the poison derived from the patient, and that they may become morbid germs? Indeed, the idea is now becoming prevalent that a number of diseases are contagious which have never been supposed to possess any such attribute. The method of their diffusion has not been clearly understood—infected *bioplasts* may be the morbid vehicles.

Vegetative growths may induce certain diseases, and specific poisons may thus be engendered in the animal economy. *Bioplasts* may be instrumental in spreading such septic conditions, and thus compound causes may coöperate in diffusing various maladies.

From what has been said it is evident that, concerning the specific natures of the poisons of a number of the epidemic disorders, we are almost entirely ignorant. We regret to have to acknowledge such ignorance, but have an ample cause of excuse. Some of these causes have been operative, at intervals at least, from time immemorial. But while this is a recognized fact, nevertheless, human genius has only been

qualified within a comparatively short time to engage in studies of such a nature. If we regard merely the eighteen centuries and three-quarters of a century of time according to our present computation of years, we can eliminate nearly eighteen centuries during which progress in such direction was at all practicable. We have scarcely to look back a decade of decades to find chemistry developing as a branch of scientific inquiry. We find hydrogen, oxygen, and nitrogen, and various other elements, shining out more brightly as the chemical discoveries of the century than the new lights of Uranus and Neptune in the contemporaneous centenary of astronomy. With the genesis of chemistry new philosophical attributes were unfolded to man, and with gradually-acquired gifts of analysis and synthesis, of eduction and production, he has clearly defined the operations of various occult atomic affinities, and is engaged in the definition of numerous mysterious phenomena of nature and of art. The microscope and spectroscope promise very material guidance in further researches, but as yet have afforded imperfect information, but the information already afforded has almost revolutionized medical philosophy relating to the subjects under consideration. While we deplore our ignorance concerning the precise natures of the poisons to which allusion has been made, we feel assured *lux lucet in tenebris*, and furthermore feel conscious, as the sequel will show, that we are already armed, through the resources of hygiene and chemistry, with means which have shorn pestilential disorders of half of their terrors.

We have found, in examining the etiological branch of our subject, that there are several paths of inquiry which have only been partially explored. With a limited knowledge in regard to vegetable parasites, and other organic germs, as causes of disease, and with a very limited acquaintance with the nature of atmospheric vicissitudes as inducing morbid conditions, with studies on these subjects at present being very intently prosecuted, it seems more difficult at this time to make a new nosological grouping of epidemics than it has

ever been before. We appear to be on the very threshold of developments which are probably to modify many of our preconceived ideas. Such being the case, I will not to-night attempt any new classification of diseases, but in treating of the disorders which have appeared as epidemics in our territory, as a matter of convenience, will merely speak of them in the order in which they have before been enumerated.

I will first consider the lessons which have been taught us by the visitations of small-pox, measles, scarlatina, and varicella, usually classified among the contagious disorders. As prefatory to such consideration it is desirable to say a few words in regard to *murrains* and *epizoöties*, which from time to time have prevailed, for between these diseases and epidemics there is often a close relationship, though not necessarily so, but it is particularly a noticeable occurrence between cow-pox and small-pox.

The prevalence of murrains has been recognized since a remote antiquity. In sacred history, Moses records, "Behold, the hand of the Lord is upon thy cattle which is in the field, upon the horses, upon the asses, upon the camels, upon the oxen, and upon the sheep: there shall be a very grievous murrain" (Exodus, ix. 3); and he further has described the disorder as "a boil breaking forth with blains upon man and upon beast" (Exodus, ix. 10). Profane history abounds in allusion to epizoöties. Homer in his "Iliad" relates:

"On mules and dogs the infection first began,  
And last the vengeful arrows fixed in man."

In Oedipus is read :

"For all those plagues which earth and air had brooded,  
First on inferior creatures tried their force,  
And last they seized on man."

It is unnecessary to multiply allusions to the numerous epizoöties which have prevailed in the world's history. The causes of these are in many cases as inexplicable as are those of some of the epidemics, but are being studied with interest and with most promising results. Those which have most re-

cently been observed in our territory have not appeared to have an intimate connection with human maladies, though in 1825 a disorder among horses, known as slavers, made a disastrous visitation, and preceded an epidemic of erysipelas and influenza throughout a part of this State.

It was a study of the relationship between vaccinia and variola, made about the commencement of this century, which led to the discovery of the great prophylactic of small-pox, viz., vaccination. Cow-pox made its appearance in England in 1745, and subsequently in 1770, when, as recorded by Aitken, "it appeared among the horned cattle with so much severity that his majesty George III., in his speech from the throne, at the opening of Parliament, on the 9th of January of that year, called upon the Houses of Parliament to take the subject into their serious consideration. The disease continued with more or less violence till 1780, and it was no doubt the expiring embers of this epizoöty which Dr. Jenner found in Gloucester, and made the basis of his investigation during that and subsequent years." In 1798, Jenner promulgated the result of his study in this direction. The medical profession of the civilized world has substantially adopted his views, and his name has almost been enshrined with that of Æsculapius.

It has not been an easy task to educate the popular mind into a belief in the prophylactic powers of vaccination, but three-quarters of a century have sufficed to accomplish the important work. With proper care, epidemics of small-pox can now be absolutely prevented, and when from neglect the disorder is encountered the patient need no longer be avoided by kindred and friends who have been properly protected. Certainly the century under consideration marks in this respect an epoch in medical history, and American physicians have been foremost in experimenting with and in advocating inoculation, and subsequently vaccination, as a means of preventing one of the most loathsome of human disorders.

Respecting the other contagious epidemics, viz., of scarlet fever, measles, and chicken-pox, the latter is ordinarily such

a mild affection as to require only passing notice. Of the others we unfortunately cannot speak so encouragingly as can be done of variola. Both prevail at times in an epidemic manner, their diffusion being favored by some unknown and peculiar condition of the atmosphere. This condition is not identical with that which propagates the meteorous diseases, for there is not generally a contemporaneous prevalence of both classes of maladies. The poison of these maladies when once introduced, especially in the larger villages and in cities, appears hardly ever to be entirely eradicated.

Now, while we cannot boast of any special means of prophylaxis, we nevertheless find that a long series of years will elapse without an extended appearance of the diseases under consideration. This phenomenon can be accounted for in two ways: 1. Atmospheric influences do not always favor their diffusion. 2. When their diffusion is thus favored, increased vigor is employed in checking their spread. For example, the apartment of the isolated patient is thoroughly ventilated, and the poison, in only an attenuated form, can be wafted from the chamber or scattered by fomites. The removal of carpets and unnecessary furniture to prevent their infection, disinfection of the air, of the excreta, of the clothing, and destruction of some of the latter by fire, and, finally, fumigation of the apartment, are some of the means now resorted to with undoubted success to stay the progress of the disorder.

Among intelligent physicians these or kindred measures are voluntarily enforced to prevent the multiplication of feci of disease, and many municipalities enjoin such sanitary precautions. Prophylaxis in this direction has certainly made progress with the advance of time.

We now come to a consideration of another group of affections, viz., typhus and typhoid fevers, malarial affections, including dysentery and yellow fever, which have been classified as infectious epidemics. Typhus and typhoid fevers have an element in their character which allies them to a certain ex-

tent with the contagious disorders; the same remark is also applicable to dysentery, though perhaps in a more limited degree. A poison is disseminated from each patient suffering from these maladies, and those exposed while in attendance upon such patients are liable to become infected; but, in addition thereto, there appears to be a more or less diffused aërial condition favoring the diffusion of the diseases alluded to. Overcrowding of tenements, imperfect ventilation, defective trapping of waste-pipes, and faulty drainage, favor the local spread of the disorders, and the soil, becoming impregnated with morbid material, renders the water used as drink a vehicle of disease. From one or more of these causes have appeared at various times outbursts of the disorders under consideration in jails, ships, camps, villages, towns, and in scattered hamlets and rural situations. Armies, as is well known, have rendered the localities in which they were tarrying pestilential in the extreme, and on breaking up their quarters have by fomites carried with them devastation along the line of their march. But modern sanitary science has eradicated or modified many causes which in war, ocean-travel, penal and eleemosynary institutions, and among mankind generally, in segregated and gregarious life, have favored the development and spread of the febrile affections under consideration.

Respecting the malarial affections, our territory is so fortunately situated as not to develop those severe types characteristic of the same class of maladies encountered in the tropics. Intermittent and remittent fevers and dysentery are diseases, however, of sufficient gravity to intimidate the residents of regions in which they prevail. The prevalence of these disorders in distinctive paludal and littoral situations has left no doubt in regard to their etiology, though the precise nature of the miasm engendered in such places has never been absolutely defined.

On a former occasion I have shown that the Pontine Marshes spread infection in the territory of the Volschi, as they contaminate the same tract of country for its modern

inhabitants.<sup>1</sup> But the Italian morass, thirty miles in length and eight in breadth, has at times been partially converted into inoffensive and fertile plains by the thorough system of drainage enforced during the reigns of Augustus, Nerva, and Trajan, and during the pontificate of Pius VI. At other periods engineering resources were neglected; rich fields degenerated into impassable and noisome bogs, while the inhabitants of the environs lost their ruddiness and acquired an anaemic pallor.

Had the efforts toward reclamation been persistently made from the time of their inception by the consul Cethagus, a baneful spot could have been permanently obliterated; stagnant waters could have been collected into running streams, quagmire converted into loam, and the low vegetation of a vast fen metamorphosed into genial fruitfulness. The earth itself would have become as magnificent a monument of the philosophy and grandeur of ancient Roman civilization as have been the classical literature and massive architecture of the historical period alluded to.

In modern times there have been imitations of the ancient methods of drainage, in numerous localities, and with the most satisfactory results, but, while we find it practicable to improve the health of certain localities by the means indicated, it seems to us at present almost a fruitless task to attempt to reclaim a large part of an entire continent by means of such sanitary engineering skill. To escape injury from irremediable regional morbific influences, the inhabitants must invoke the resources of private hygiene and establish physical vigor capable of withstanding baneful surroundings.

In regard to yellow fever, we find its poison engendered and most intensified under the equatorial sun—in a zone where vegetation is monarch, and where aboriginal man, enervated and to a great degree secluded by reason of climatic causes, as regards his highest attributes, is no more typical of manhood than vegetation is typical as found on mountain

<sup>1</sup> Anniversary Discourse, New York Academy of Medicine, Gouverneur M. Smith, 1870.

eminence or in polar latitude. The poison, however, diffuses itself over semi-tropical regions, and is conveyed to the temperate zone, and here, during the summer solstice, especially if favored by a hot and humid atmosphere and insalubrious local conditions, it can for a season operate disastrously. But the resources of science step in to arrest its operations. Experience has taught that wisely-administered quarantine regulations, conjoined with local sanitary precautions, can either blockade its entrance into northern ports, or at least deprive it of resources favoring its epidemic diffusion. In corroboration of this fact, we have simply to study the frequent threatened invasions of the port of New York, and of various cities on our southern seaboard, and specially the sanitary history of New Orleans during our recent war.

Respecting the latter subject, our distinguished Fellow, Dr. Elisha Harris, in a paper read before this Academy, January, 1865, on "Hygienic Experience in New Orleans during the War," etc., appropriately said: "Such immunity from her accustomed scourging of yellow fever had not been enjoyed by New Orleans the last half century. Even her wisest hygienists had been generally discredited, and often derided, when they publicly taught, as Fenner, Barton, Simonds, and Bennett Dowler had most faithfully, that the active and localizing causes of yellow fever, and the high death-rate in that city, were preventable. There was a truthfulness worthy of the medical profession in the words of Dr. Barton, who, as president of the New Orleans Sanitary Commission, sitting in grave and scientific consultation upon the terrible visitations of yellow fever, unhesitatingly declared the causes of that pestilence and the city's excessive insalubrity '*entirely susceptible of cure*.' But how few persons appreciated the truth of Dr. Barton's words of prophecy, when he said that 'upon the broad foundation of *sanitary measures* we can erect a monument of public health, and that if a beacon-light be erected on its top, and kept alive by proper attention, this city will be second to none in this first of earthly blessings!'"<sup>1</sup>

<sup>1</sup> "Bulletin New York Academy of Medicine," No. 30, September, 1865.

I come now to consider a group of affections varying greatly in their character, as regards both the severity and the nature of their symptoms. I allude to influenza, a comparatively mild affection; pneumonia typhodes, a grave disorder; diphtheria, a malady of similar gravity; cholera, a distemper universally dreaded; and erysipelas, likewise serious in its character. These maladies, when appearing in an epidemic manner, are in some instances apparently caused, and in other instances perhaps merely diffused, by atmospherical conditions, the precise nature of which we are for the most part ignorant. In three of them, symptoms of irritation and inflammation of the respiratory tracts are particularly noticeable; in one of them lesions of the *prima via* are as peculiarly marked, while in another the dermic tissue is specially involved.

These disorders have been before grouped as meteoritious affections. Diphtheria and cholera are now recognized as contagious diseases; but their prevalence is at times so peculiar and general that it has been difficult to ascribe their spread to contagion alone. It seems proper, in our present state of knowledge, to admit that the germs of these maladies, as derived from patients, meet with aerial and terrene conditions particularly favorable to their diffusion, and consequently many more people are smitten by them than those coming in contact with the sick.

The poisons of the other affections have seldom, in this country, offered opportunities for study. Their sudden and wide-spread appearances seem to teach that atmospherical conditions are important factors in their production.

Epidemic influenza and typhoid pneumonia have only occasionally been observed here. Diphtheria, while it has prevailed in our territory as early as 1751, and at a few subsequent periods, had attracted little attention until within a few years. Of late, especially in our large cities, its poison has become acclimated, and like the variolous virus is constantly operative, but not always in an epidemic manner. The disorder possesses a contagious element. While little can be

done to correct any general condition of the atmosphere which favors the diffusion of diphtheria, yet the local measures of purification now in vogue are potent in preventing the extension of the disorder by contagion, and by thus destroying the local foci of disease we prevent also its diffusion by meteoratious influences.

Repeated opportunities for studying epidemic cholera both on shipboard and on land have been afforded during the century; but science has failed to define specific choleraic germs. The study of the subject, however, has not been nugatory. The conditions favoring the development and spread of this disorder are allied in character to those favoring the outbreak and diffusion of several other forms of pestilence. The germs of the disorder are supposed to be microscopic vegetative growths; such, indeed, is the present prevalent opinion. The perennial habitat of its peculiar poison is India; and the world, to a greater or less extent, is perennially inoculated with cholera from this great focus of the disease.

Routes of travel are its favored highways. The traveler may convey by luggage, etc., from an infected region the germs of a poison which, under favoring circumstances, may smite him with death in a distant land. A case thus developed is capable of spreading the disease to those about him through the material vomited, ejected from the bowels, or eliminated by the kidneys, unless such oral, anal, and renal excreta are disinfected either by a strong acid or by similar potent means of destruction. When such measures are not resorted to, and large numbers of cases are suffering from the disease, the general atmosphere may become so contaminated as to carry the poison for some distance; but the distance to which it can be meteoratiously spread is uncertain. I cannot enlarge on this topic, but would remark that, if our sanitary guardians keep informed in reference to the foreign prevalence of the malady, steps can be taken here to prevent either its introduction or its general prevalence. A recent report, published under the auspices of the United States Congress, very truthfully says: "Nothing is more clearly proved by the his-

tory of cholera than that epidemics of this dreaded disease can be controlled by *vigorous hygienic measures. The true remedy against cholera is preventive medicine.*<sup>1</sup>

Regarding epidemic erysipelas, it may be said that few opportunities have been offered for studying its peculiarities. The disorder is kindred in its nature to the one originating in our hospitals, but differs from it in appearing over large sections of territory.

Another disorder to which no allusion has been made occasionally prevails in an epidemic manner, and is peculiarly distressing on account of the class of persons affected thereby. Reference is made to *puerperal fever*. While it may not be possible to prevent sporadic cases of the malady, nevertheless, its ordinary prevalence in lying-in asylums is attributable to gross and culpable carelessness, and, with our present knowledge of the etiology of the disease, its conveyance by accoucheurs, attendants, etc., is an iniquity scarcely less abhorrent than that of inducing criminal abortion. The efficient means now employed to prevent the outbreak and spread of the distemper in maternity hospitals, and to prevent the portability of its poison from these institutions and from cases in private practice, and of congeneric poisons to women about to be confined, if properly carried out, can almost eradicate the affection. Such prophylaxis is a result of the intelligent study of the subject within a comparatively few years.

No more interesting field of study regarding epidemics is to be found than that relating to armies when engaged in active service. During the world's history, the javelin and lance, the sling and falchion, the tomahawk and bayonet, shot and shell, have killed their hundreds of thousands; but, while contending arms have sacrificed innumerable hecatombs of lives, during these same strifes disease has proved a more disastrous foe of valiant battalions than inimical weapons of war. The countless belligerent forces which have from time to time been mustered, containing the youth, the pride, the flower

<sup>1</sup> "Cholera Epidemic of 1873 in the United States," Washington, 1875, p. 19.

of the earth, and whether or not engaged in holy or unholy warfare, have time and time again been desolated by disease. Indeed, an almost decimating decimation has occasionally withered the power of what has seemed an invincible force.

Ancient history has embalmed the memories of surgeons of former days. We linger when reading of the care bestowed upon the wounded Machaon, we mourn when learning of his decease, we rejoice at the divine honors paid to his memory, and hallow the temple erected in his honor at Massenia. But the medical officers of those days were chiefly lauded for their surgical abilities—their modern brethren must possess skill of a wider latitude.

The causes which have induced disease and death among soldiers in their active campaigns until a comparatively recent period, if not overlooked, have not, at least, received that prophylactic attention which humanity demanded. As lately as during the Crimean war—a war in which civilized nations were contending, in which the prowess, the strategy, the engineering skill, and the mighty armaments of strife of the nineteenth century, were on trial and being scanned by the world—a waste of human life was permitted from preventable diseases which has cast a stigma on nations, the bravery of whose soldiers has elicited the plaudits of continents.

Our own republic was plunged soon after in the horrors of civil war—a war which called into the service, including reënlistments of veteran volunteers, an army of loyal citizens numbering 2,753,723. The lessons learned from the Crimean war had been studied on this side of the Atlantic. “We were left to no vague conjecture as to the causes which produced the fearful mortality among allied troops before Sevastopol—a mortality which, as has been truly said, has never been equaled since the hosts of Sennacherib fell in a single night.”

The proclamation of the President of the United States, calling for troops, was issued on the 15th of April, 1861, and with its echo was heard the tap of the drum, simultaneously firing the patriotism and philanthropy of the North. The

recruit was scarcely under marching-orders when means were being devised to protect him from disease.

On the 23d of April, 1861, but eight days after the President's manifesto, an association of physicians was formed in this city known as the "New York Medical Association for the Supply of Lint, Bandages, etc., to the U. S. Army." The object of the society was not alone to furnish means for the treatment of wounded, but to provide as far as possible, to the regiments gathering at the front, hospital clothing, etc., for rapid equipments included bare necessities; and recruits would almost necessarily suffer from disease in their sudden transition from civil to military life.

The society had an existence of three months, and numbered fifty-five physicians, many of them Fellows of this Academy. During this time eighteen hundred dollars in money was collected and judiciously expended; vaccine virus was distributed to various regiments and the hospital at Fortress Monroe; numerous articles gathered from the benevolent of an estimated value of \$11,548.46 were carefully dispersed to thirty-six regiments, six hospitals, to the Naval Department, to the Medical Purveyor U. S. Army, and articles of diet placed in a proper channel to reach those requiring them.

While this and numerous other initial local steps were being taken to aid in maintaining the physical integrity of the army, wise measures were being devised to concentrate into a single organization the benevolence of loyal States. As the result of such deliberation the U. S. Sanitary Commission was organized on the 12th of June, 1861. While the Government was sufficiently animated in its efforts to preserve the national Union, it scarcely appreciated the importance of sanitary regulations to maintain the health of troops, and it needed the stimulus of an association fresh from the people to arouse it to a full sense of duty in this regard. The project of infusing civil aid in military administration met with disapprobation in certain official quarters.

It would be impossible on an occasion like the present to describe the work performed by this association—an associa-

tion fostered at its incipiency by several of the distinguished Fellows of this Academy, and aided in various ways by a number of us, both here and "at the front," by voluntary services. Can a few sentences or paragraphs epitomize its operations?

Under the auspices of the Sanitary Commission, military, medical, and surgical monographs were prepared relating to the prevention of disease, and to the hygienic as well as medical management of the disorders and injuries incident to war. Salutary advice was afforded regarding the proper sites for camps and for the sites and proper modes of construction of hospitals. A corps of special inspectors of the general hospitals of the army was appointed, composed of gentlemen of known repute. No less attention was called to the dietary of troops, and through the agency of the association scurvy was prevented in some sections of the country, and its ravages arrested in others. Special care was taken for the moving of sick and wounded by means of thoroughly-equipped ambulances, hospital cars, and transports.

Armies stationed in unhealthy localities were made objects of special surveillance. At New Orleans the commanding general and Dr. McCormick, medical director of the department, were alert in guarding the soldiers from disease. "The fear of the outbreak of yellow fever during the summer months, and the danger to which a Northern army would be exposed by its prevalence, acted as a constant stimulus to the most careful measures of prevention" . . . Early in July, 1862, the whole number of sick in that department, in regimental and general hospitals, was only four hundred and seventy-two out of a force of about twenty thousand men (nineteen regiments of infantry and seven batteries), less than two and a half per cent. . . . This favorable state of health among the troops in the Department of the Gulf was maintained during the whole war. In November, 1863, the experienced inspector of the commission, Dr. Crane, writes: "I have never seen so little disease among troops in the field. But little over four per cent. of the present force is on the sick-list." . . . It

<sup>1</sup> "United States Sanitary Commission Memoirs," Philadelphia, 1866.

is certainly very remarkable that a far higher health-rate was maintained during the war among the troops on the coast of Carolina and the delta of the Mississippi than in the mountainous regions of Tennessee and Virginia."

Never before in the world's history had such powerful forces been gathered and been protected by sanitary care—the voluntary gifts to provide for such protection amounting to nearly five million dollars. It was the enlightened care on the part of the people and of the Government of their troops which contributed in no small degree to the maintainance of the integrity of a nation whose centennial birth-year we now celebrate. The lessons derived from the war are not to be forgotten, but will prove of value to coming generations. In future conflicts of the earth Hygeia will assert her supremacy beside that of Mars, and the horrors of war be gradually and gradually diminished, until the time shall come when

"No more shall nation against nation rise,  
Nor ardent warriors meet with hateful eyes,  
Nor fields with gleaming steel be covered o'er,  
The brazen trumpets kindle rage no more;  
But useless lances into scythes shall bend,  
And the broad falchion in a ploughshare end."

The sanitary experiences of the late war have taught lessons which had never been so thoroughly impressed, and which are as important respecting civil as military life. They have shown that insalutary places can be made comparatively salutary, and have almost shown, to use the words of another, that "vanquished Nature yields its empire to man, who creates a climate for himself;" they have illustrated the fact that men may be congregated in vast numbers, and yet not be mercilessly ravaged by disease; they have proved that a proper dietetic regimen will arrest the progress of and prevent certain disorders; they have demonstrated that pure fresh air, which is so lavishly and beneficially distributed by Nature, is a more powerful factor in the relief of sick and wounded than medicinal herbs and minerals, which are also benefi-

ciently provided, but are offered more sparsely, and as mere adjuvants to the breath of life.

The results of these and of other teachings derived from the same experience are already apparent, and have influenced public opinion. As an illustration of this, I need only refer to the prevailing views regarding hospital construction. While the disadvantages of ordinary infirmary buildings had long since been observed, never had communities been brought to fully realize their imperfections until, on a large scale, the advantages were shown of treating patients either in tents or in inexpensive, simple, commodious, and thoroughly-ventilated pavilions. Such structures are as well adapted to the treatment of civilians as of soldiers; and, while for civil purposes they should be built in a more durable manner than those employed during periods of war, nevertheless, they should not be very permanent in their nature, but be destroyed after a comparatively few years of an intermittent occupancy. Mr. James W. Beekman, in writing on this subject, has well said: "The architectural necessities are light, air, speedy removal of refuse, and great facility in cleansing. Architectural display in a hospital is a crime. 'Do not build for a long futurity.'"

While such axioms are becoming household words, they are dispersing knowledge of a wider significance than their literal interpretation would convey. If the homes of the sick must be models in their sanitary arrangements, an antithesis of like importance is believed to be true, and as a result increased attention is being paid to the proper construction of all kinds of human habitations, and more attention is being paid to the selection of their sites, etc.

In this brief and desultory review which I have given of my subject, it may be said that little has been advanced of a positive nature in regard to the specific poisons which occasion the epidemics and zymotic disorders which have been considered. I have refrained from giving in detail the various prevailing theories regarding them, and one reason for such omission may be found in the fact that the most accom-

plished experts shrink as yet from defining with certainty the precise nature of these subtle deleterious agents.

The medical world is now engaged, as I have before said, in a special study of minute vegetable organisms, to say nothing at present of the lower forms of animal existence and of the influence exerted by them in various diseases. They are found in certain processes of inflammation, in tissues, in secretions and excretions, and in the atmosphere. We are seeking intently for the biography of parasites, for information regarding their germs, their growth, their longevity, and their death. We are endeavoring to learn at what periods of their existence they may be offensive, and whether or not it is the germ or the parasite which is capable of being conveyed or of remaining in a passive condition awaiting favorable circumstances for increased growths. Ordinary vegetation affords edible and poisonous growths; microscopic vegetation is not destitute of potent properties.

Kindred to this subject of vegetable parasites is that branch of science which has been developed during the century, viz., helminthology or entozoölogy. Between thirty and forty human entozoa have been carefully described. Many of these in their adult life are of such magnitude as to have early attracted notice. Moses doubtless alluded to dracunculi or Guinea-worms when describing the "fiery serpents which afflicted the children of Israel during their stay in the neighborhood of the Red Sea" (Cobbold), and Agatharchides doubtless alluded to the same helminth in his clever account of the "little snakes" affecting the limbs and muscles of the inhabitants of the same seaboard.

While several animal parasites were of sufficient size to have early attracted notice, nothing was definitely known, until comparatively recently, concerning their origin, their larvæ, their growth, their migrations, and again several entozoa were so diminutive in size as to have altogether escaped observation until discovered by microscopic assistance.

A number of diseases prevail among inferior animals attributable to entozoa, and among mankind from similar causes.

Several of the former appear as epizoöties and of the latter as epidemics. Of the epizoöties, the more noticeable are the *gapes*, a disorder prevalent among poultry and among a number of birds depending upon the presence of seerostomata in the trachea, a disease first described by Dr. A. Wiesenthal, of Baltimore, in 1799; the *rot-disease*, especially destructive to sheep, and caused by the presence of the *fasciola hepatica*, or liver-fluke; the disorder among swine attributable to *trichinæ*; the malady among swine, dogs, wolves, etc., due to *tæniae*. Of the epidemics due to entozoa, the most interesting for present consideration are those due to *tæniae* and *trichinæ*.

How greatly has our knowledge been increased within a few years concerning the cestoidea or tapeworm group of helminths, due in great measure to the experimental study of the subject by Von Siebold and Küchenmeister! How carefully have cystic worms and larvæ been observed, their migrations noted, and the diseases induced by them in their various stages of development been described!

What interest has been awakened in regard to nematoidea or round worms, especially as relates to the *trichina spiralis*. The history of the life and peculiarities of this parasite has been as carefully depicted as if it was one of our familiar domesticated animals. Zoölogists have carefully described to us the fauna of continental areas and of epochs, and are now furnishing us with volumes relating to entozoa.

As a result of such labors, agricultural interests have been promoted by preventing diseases among important inferior animals, and mankind has been further benefited by escaping a number of loathsome diseases. Fortunately our country has not been very seriously invaded by this class of maladies. Further labors in the direction indicated must be prosecuted; unrecognized entozoa are doubtless inducing mischief, and the habitats of those which are known are not fully appreciated.

In the civilization of our century, Europe, Asia, Africa, and America, are freely interchanging commercial commođities. While gems and bullion, cereals and fruit, fabrics and

manufactures, are being widely distributed for the comfort of mankind, let science prevent the diffusion of entozoic fauna by preventing human contamination with them in the respective continental habitats of these obnoxious helminths.

Zoölogical investigations relating to parasites are in advance of botanical researches concerning minute vegetable organisms, but while this is so, we are gathering important information regarding vegetative germs as effecting cholera, diphtheria, typhoid fever, and other disorders. Such studies are being prosecuted with the same zealous spirit as that which actuated Linnaeus, Wolff, and Goethe, in other departments of botany, and are to be crowned with a similar success. As yet we stand at the threshold of the branch of science under special consideration, and are merely pioneers. In this respect, we may almost be said to be contemporaneous with Zoroaster, Aristotle, and Plato, in their study of the general subject of botany.

This being the case, the question arises: Have the benefits of sanitary science been overestimated? The ultimate nature of light has not been absolutely defined, but its salutary effects are clearly intelligible. The precise nature of electricity is not fully understood, but its nature and properties are sufficiently appreciated to be utilized in an almost miraculous manner. So various occult morbid influences are known to be operative by the prevalence of peculiar phenomena. The causes favoring such prevalence are often discernible, and if not directly discernible the causes favoring their prolonged operations can be clearly observed and appropriate prophylactic measures can be resorted to. While neither municipal, State, nor Federal legislation can enact and enforce laws so governing the private life of a citizen as to promote his healthy growth, nevertheless jurisdiction can impose laws which restrain an individual from jeopardizing the lives of his neighbors by his sanitary negligence, and can regulate matters relating to public hygiene.

The enlightened nations of the earth are now paying special attention to hygienic legislation and to the promulgation of

sanitary instruction. Sovereignties and municipalities alike are vigilant in guarding the general physical welfare of the people. Intelligent boards of health are now established throughout our land in the larger cities, and the villages are instituting similar provisions of safety. This salutary state of affairs, which has comparatively recently been inaugurated on so comprehensive a scale, has been due to the persistent assiduity of our profession in pressing upon communities the important results to be derived from such organizations. While the boards of health alluded to may at times fall into unskilled management, such transfer can be but temporary, as the people are already convinced that scientific skill must wield the helm in such departments, and will never consent to revert to that condition of sanitary apathy which but a few years ago was so apparent to medical men.

But we must not be content in urging alone the establishment of local boards of health. State boards and national boards must be organized, having a recognized official authority. Between the local boards and those of the state and nation there must be authoritative communication, and the national boards of the various countries of the earth must unite in holding official correspondence relating to matters of the public health. Some such provision of safety will assuredly become established.

Already we recognize the advantages to the nation from the daily reports of the War Department relating to the weather. The numerous meteorological observations made at distant points, and diurnally, at fixed hours, telegraphed to Washington, are concentrated under scientific supervision into terse dispatches, and daily published throughout the land, giving the areas of storm and dryness, of heat and cold, and foretelling the approach of tempest, of calm, and sunshine—thus aiding commercial, agricultural, and other interests. A somewhat similarly arranged sanitary department must take its place among the national bureaus.

A few more thoughts must be offered on a subject to which slight allusion has only been made. When epidemic causes

of disease are prevalent, to say nothing of the personal means suited to induce vigor, to say nothing of ventilation, of drainage, sewerage, etc., of domiciles and localities, as aids in escaping injury, chemistry affords efficient agents to neutralize pernicious local conditions which are contaminating the atmosphere. These agents have chiefly been presented by modern science, and are the outgrowth of the century.

Human ingenuity, however, has long been exercised in this direction. While we may now deride many ancient customs, some of which were of superstitious origin, and many arts of the alchemists, we must bear in mind with respect many primitive means of disinfection and preservation. Jewish priests exercised hygienic supervision of households and used appropriate means in purifying the clothing and dwellings of those afflicted with the leprosy. Herodotus and others have recorded the manner of embalming the dead. Egyptians early understood the processes of drying to prevent decomposition. Ulysses burnt sulphur to destroy the infection arising from dead bodies, and Roman shepherds burnt sulphur and herbs when sacrificing to Pales, the goddess of their sheepfolds.

It is unnecessary to multiply examples of this nature which illustrate dim insights into a science into which we are peering, and even still quite cloudily. Nevertheless, progress has been made, and we possess a group of disinfectants which may be classified as follows: 1. Those which destroy or prevent the multiplication of the lower forms of organized bodies; 2. Those which have the property of absorbing deleterious principles and thus rendering them inert; 3. Those having the power to decompose various noxious agents into less poisonous or innocent principles. This classification as a matter of convenience is sufficiently accurate for our present purpose and partially exhibits the precision aimed at by modern science. Besides these we recognize the potent agencies of heat and cold.

“In such indexes,  
There are seen  
The baby figures of the giant mass  
Of things to come at large.”—SHAKESPEARE.

The chemical agents which we can now utilize as disinfectants are more numerous and, in many respects, are vastly more potent than any hitherto offered, and animate us to further exploration and further achievements as the land-growths wafted to the ship of Columbus stimulated to a prolonged and successful search for our Western Continent.

Entering on a new century under most favorable auspices, it can safely be predicted that before its ten decades have been spent, measures of prophylaxis and of therapeutics will be established of far more importance than any of those which during the previous history of the world have been developed by scientific ingenuity.



